R842-09 ERIC REPORT RESUME

ED 010 213 1-31-67 24 (REV)

EMOTIONS AND IMAGES IN LANGUAGE--A LEARNING ANALYSIS OF THEIR ACQUISITION AND FUNCTION.

STAATS, ARTHUR W.
XY081702 UNIV. OF WIS., MADISON CAMP., RES. AND DEV. CTR.

BR-5-0216-OP-1
OP-1
- -66 OEC-5-10-154
EDRS PRICE MF-$0.09 HC-$1.08 27P.

*LEARNING THEORIES, REINFORCEMENT, *LEARNING PROCESSES, TRANSFER OF TRAINING, *LANGUAGE, LANGUAGE DEVELOPMENT, LANGUAGE PATTERNS, LANGUAGE RESEARCH, *CONDITIONED STIMULUS, STIMULUS BEHAVIOR, *THEORIES, EMOTIONAL EXPERIENCES, *RESEARCH AND DEVELOPMENT CENTERS, MADISON, WISCONSIN

THIS ARTICLE PRESENTED THEORETICAL AND EXPERIMENTAL ANALYSES CONCERNING IMPORTANT ASPECTS OF LANGUAGE. IT WAS SUGGESTED THAT A LEARNING THEORY WHICH INEGRATES INSTRUMENTAL AND CLASSICAL CONDITIONING, CUTTING ACROSS THEORETICAL LINES, COULD SERVE AS THE BASIS FOR A COMPREHENSIVE THEORY OF LANGUAGE ACQUISITION AND FUNCTION. THE PAPER ILLUSTRATED THE POSSIBILITIES OF SUCH AN INTEGRATED LEARNING APPROACH BY SHOWING THAT WORD MEANING IS ACQUIRED ACCORDING TO THE PRINCIPLES OF CLASSICAL CONDITIONING. HOWEVER, WORDS THAT HAVE ACQUIRED EMOTIONAL MEANING THROUGH THE PROCESS OF CLASSICAL CONDITIONING FUNCTION FOR THE INDIVIDUAL ACCORDING TO THE PRINCIPLES OF INSTRUMENTAL CONDITIONING. THE FINDINGS PRESENTED, DERIVED FROM THE INTEGRATED LEARNING THEORY, CONTRIBUTE TOWARD A LEARNING CONCEPTION OF WORD MEANING, INDICATE ONE OF THE MOST POWERFUL FUNCTIONS OF LANGUAGE (ITS MOTIVATIONAL FUNCTION), AND DEMONSTRATE THE VALUE OF THE APPROACH. AN ANALYSIS OF ANOTHER TYPE OF WORD MEANING, DENOTATIVE MEANING, HAS ALSO PRESENTED. (JC)

Occasional Paper No. 1

EMOTIONS AND IMAGES IN LANGUAGE: A LEARNING ANALYSIS OF THEIR ACQUISITION AND FUNCTION

Arthur W. Staats
Professor of Educational Psychology

Research and Development Center
for Learning and Re-Education
University of Wisconsin
Madison, Wisconsin

1966

The present paper was written under the support of the Office of Naval Research, Contract Nonr-2794(02), and the United States Office of Education, Department of Health, Education, and Welfare, under the provisions of the Cooperative Research Program, and was delivered at the Verbal Behavior Conference organized by Kurt Salzinger and Joseph Zubin in New York, September 16–18, 1965.

Center No. C–03 / Contract OE 5–10–154

POLICY BOARD OF THE CENTER

Max R. Goodson, Professor of Educational Policy Studies
Co-Director, Administration

Herbert J. Klausmeier, Professor of Educational Psychology
Co-Director, Research

Lee S. Dreyfus, Professor of Speech and Radio-TV Education
Coordinator of Television Activities

John Guy Fowlkes, Professor of Educational Administration
Advisor on Local School Relationships

Chester W. Harris, Professor and Chairman of Educational Psychology
Associate Director, Research

Leo R. Hilfiker, Coordinator, Field Research and Development
State Department of Public Instruction

Burton W. Kreitlow, Professor of Agricultural and Extension Education
Coordinator of Adult Re-Education Activities

Julian C. Stanley, Professor of Educational Psychology
(on leave September 1, 1965 - August 31, 1967)

Lindley J. Stiles, Dean of the School of Education
Advisor on Policy

Henry Van Engen, Professor of Mathematics and Curriculum & Instruction
Associate Director, Development

PREFACE

The primary goal of the R & D Center for Learning and Re-education is to improve cognitive learning in children and adults, commensurate with good personality development. Knowledge is being extended about human learning and other variables associated with efficiency of school learning. This operation is being performed through synthesizing present knowledge and through conducting research to generate new knowledge. In turn, the knowledge is being focused upon the three main problem areas of the Center: developing exemplary instructional systems, refining the science of human behavior and learning on the one hand and the technology of instruction on the other, and inventing new models for school experimentation, development activities, etc.

Professor Arthur Staats has, for a number of years, been conducting experimental and theoretical analyses in the task of developing what he calls an integrated-functional learning theory of human behavior. In addition to providing a conception of human behavior, one of the aspects of the theory is that its principles and methods should contribute to the solution of problems of human behavior. Some of his present work on cognitive learning is very relevant to the above stated purposes of the R & D Center and, as the present article, is being supported by the Center. Thus, this first occasional paper presents theoretical and experimental analyses that concern important aspects of language.

Herbert J. Klausmeier
Co-Director for Research
Professor of Educational Psychology

CONTENTS

LIST OF FIGURES

ABSTRACT

Separatism in learning approaches and research methods has led to piecemeal extensions of learning principles to the study of language behavior. It is suggested that a learning theory that integrates instrumental and classical conditioning, cutting across theoretical lines, can serve as the basis for a comprehensive theory of language acquisition and function. The present paper illustrates the possibilities of such an integrated learning approach by showing that word meaning is acquired according to the principles of classical conditioning. However, words that have acquired emotional meaning through the process of classical conditioning function for the individual according to the principles of instrumental conditioning. That is, positive emotional meaning words will strengthen behaviors upon which they are contingent in the same manner as will other classes of positive reinforcing stimuli. Negative emotional meaning words function as conditioned negative reinforcing stimuli.

These findings, derived from the integrated learning theory, contribute toward a learning conception of word meaning, indicate one of the most powerful functions of language (its motivational or reinforcing function), and in so doing demonstrate the value of the approach.

In addition, an analysis of another type of word meaning denotative meaning is presented.

1

INTRODUCTION

The science of learning is concerned with two types of events—(1) environmental events, which are called stimuli, and (2) the actions of living organisms, which are called responses—and the relations between those events. Moreover, the study involves those particular environmental events that affect responses as well as the principles by which the effect occurs.

It is quite apparent that although the science of learning studies the relationship of the external stimulus to the externally observed behavior, the relationship is effected by internal physiological events. If one's purpose was to trace the complete chain of events from the moment of environmental stimulation to the advent of the response, it would be necessary to elucidate the nature of these internal physiological events.

Of course, it is not necessary for any particular field of science, or any particular scientist, to study the relationship of events in some other area to those in which he is interested. The scientist has a legitimate task in finding lawful empirical relationships in a particular, circumscribed area of study—at least in the beginning of the study. Thus, for example, the laws of conditioning or learning have a justification and utility which are quite independent of the physiological events underlying those laws. Important aspects of human behavior are acquired, maintained, and changed according to such learning laws. These laws produce prediction and control, as do the laws in other fields of science, and are justifiably studied as a separate endeavor.

Nonetheless, it is productive to relate the events in one area of science to the events studied in another area. A more complete, satisfying, and convincing conception may arise in this way. Moreover, a much more detailed theory may result, from which improved experimentation can be derived as well as improved statements and procedures for the solution of practical problems. Thus, the attempt to relate the study of language behavior in man to the field of physiology, one of the purposes of the conference for which this paper was written, seems potentially to hold promise, and it seems valuable to consider language learning in terms that lend themselves to discussion using physiological terms.

Before getting into the specific aspects of language, there are a few relevant points to be made concerning the author's general approach. First, learning approaches to language have been separatistic, involving antagonistic endeavors that have developed separate terminologies, separate procedures, and separate philosophies of science. For example, there have been people interested in the operant conditioning of verbal behavior (see Salzinger, 1959; Skinner, 1957; Staats, 1957, 1961), who many times eschew the experimental results and conceptions of investigations of word meaning and semantic mediation (see Mowrer, 1954; Osgood, 1953; Staats, 1961) and, many times, these latter investigators reject the importance of operant conditioning in the area of language. A third approach has focused upon verbal learning, including serial and paired associate verbal learning (see Underwood & Schulz, 1960). And this approach has ignored the findings of the former two areas—an action that has been largely reciprocated.

Thus, even though these approaches spring from the same tradition, they have been theoretical competitors rather than complementing a general learning approach. The great disadvantage is that no one of these approaches by itself is adequate to give a comprehensive and penetrating account of language. Even a partial list of some of the various aspects of language indicates the complexity of the events involved. The operant conditioning of speech response is important, as is the manner in which speech responses come to be controlled by stimuli of various kinds: environmental objects, internal stimuli, written verbal stimuli, other verbal responses, other responses of the speaking person, and so on. In addition, words have other functions in their role as stimuli. Words come to elicit various responses

through classical conditioning (as will be discussed) as well as to control imitative vocal responses and other motor responses through operant discrimination learning.

The present writer has been concerned on both experimental and theoretical levels with various aspects of a learning analysis of language (Staats, 1955, 1957, 1961, 1963, 1964a, 1964b, 1965b; Staats & Staats, 1963). The basic theme in this approach is that the separate learning orientations alone cannot adequately deal with such complex behavior and that an adequate learning theory must involve an integration of learning principles into one theoretical framework. Thus, an adequate learning theory must be capable of dealing with verbal learning of the paired associate and serial learning variety, concepts of word meaning and semantic mediation, verbal mediation, the operant conditioning of vocalizations, and the like, in a manner so that a comprehensive analysis of actual language may be made.

This is not the place for such a comprehensive account, however. The present paper will be restricted to the discussion of the acquisition and function of certain types of word meaning. Nevertheless, even in this more restricted area, it is necessary to integrate both classical and operant conditioning principles. This is necessary especially when providing a learning account of the acquisition and function of affective or emotional word meaning. Thus, although affective word meaning is acquired according to the principles of classical conditioning, its function appears to involve the principles of operant conditioning.

II

AFFECTIVE OR EMOTIONAL WORD MEANING

MEANING ACQUISITION

There are apparently many environmental events (stimuli) that when presented will elicit a response in the normal human. That is, when one of these stimuli occurs it will be followed by the particular response it customarily elicits. Sounds, tactual stimuli, electric shock, food, visual stimuli, and so on, will elicit various responses. Many of the responses involved are ones that would ordinarily be called reflexes—various internal responses such as the flow of gastric juices, the rate of the heart beat, the blood volume in various internal organs, the adjustment in size of the pupil to changes in light conditions, and the activity of the sweat glands; some motor responses such as the blink of the eye to corneal stimulation and the knee-jerk to stimulation of the patellar tendon.

By itself the finding that certain stimuli would elicit responses in living organisms was originally momentous. The demonstrations began to indicate that at least certain aspects of behavior could occur according to natural forces and lawful principles and were thus subject to objective study. Prior to demonstrations that responses could be lawfully caused, the prevailing belief was that behavior was a function of capricious, supernatural, and unknowable forces.

The power of the demonstration that some responses are a result of the preceding presentation of a stimulus was very considerably extended by the findings of Pavlov. Pavlov found that stimuli that did not have the power to elicit a particular response, as did some other stimulus, could gain that power from being paired with that other stimulus. For example, food powder in the mouth is a stimulus that reliably elicits the response of the salivary gland, resulting in the rapid secretion of saliva into the mouth. If a stimulus that does not elicit this response is paired with the food powder, this stimulus will after a number of pairings also come to elicit the response.

The stimulus that will on first presentation elicit a response is called an unconditioned stimulus, or $\underline{UCS}$. The stimulus that will not elicit that response, but comes to do so from being presented along with the unconditioned stimulus, is called the conditioned stimulus, or $\underline{CS}$. Many times not all of the total response elicited by the $\underline{UCS}$ is conditioned to the $\underline{CS}$. For example, food in the mouth may result in chewing responses and so on, in addition to the salivation. These portions of the total response to the unconditioned stimulus may not be conditioned to the $\underline{CS}$.

Circumstances that fulfill the process of classical conditioning appear to occur ubiquitously in everyday life. For instance, in the individual's life experience there are many, many occasions where a word is systematically paired with a particular aspect of the environment. The word HURT, for example, is paired with painful stimuli; the word BAD with punishing stimuli; the word CAT with cats; CARS with cars; GREEN with green objects; GOOD with pleasant objects; NASTY with unpleasant objects; SWEET with objects that elicit a certain sensory response; MUSIC with certain types of sounds; and so on.

Whenever such systematic pairing takes place it must be expected, upon the basis of our knowledge of the principles of classical conditioning, that any response elicited by the stimulus object will be conditioned to the word with which it is systematically paired. This pairing does not have to occur on each presentation of the object or each presentation of the word, as we know from experimentation. Thus, purely upon the basis of the principle of classical conditioning and the observation that words and environmental stimuli are systematically paired, it would be expected that classical conditioning would result in words that elicit responses. This process has been vaguely discussed in common sense terms for a long time under the term <u>meaning.</u> It may be suggested that a word becomes meaningful when it comes to elicit a conditioned response

through classical conditioning. (There are other types of training that will also make a word meaningful that will not be described herein.)

Thus far, the basic principle of classical conditioning has been described briefly. And the principle has also been extended to the consideration of certain naturalistic observations that a word may be systematically paired with an aspect of the environment. In this analysis the principle of classical conditioning constitutes the basic theory, and the suggestion that the principle applies to the acquisition of word meaning constitutes a lower-order principle or hypothesis. The next step in the development of the theory is to derive experimental hypotheses from the lower-order principle and then subject the experimental hypotheses to verification. In so doing the two more general statements will also be tested.

The author began this type of verification while still a graduate student, albeit in an informal manner. The experimental hypothesis was first explored with an organism that was accessible to the manipulation of the simple naturalistic procedures—a family cat named Max. In the life of every well-bred cat a type of training is customarily conducted that is called toilet training. One time honored strategy that is used is to catch the animal in the undesirable act in the house and to apply a mildly aversive stimulus—a spanking with a rolled up piece of newspaper for example. This is then followed by ejection from the premises. Since this type of spanking was necessary in producing a well-bred cat, with the opportunity for many training trials, it was available as the unconditioned stimulus for testing the experimental hypothesis. The only thing still necessary was to present the word to be used as the conditioned stimulus each time that Max was "stimulated" with the paper roll.

The "spanking stimulus" would be expected to elicit internal responses of various kinds in addition to the observable escape responses made by Max. The word NO was paired with the UCS and would be expected to become a CS and elicit at least part of those responses. And that is what occurred. After a number of trials Max very reliably responded appropriately to the word NO. If she began to claw the sofa, for example, it was only necessary to say the word NO and she would stop what she was doing and scamper a few feet away from the spot. If she jumped on the kitchen table it was only necessary to say NO and she would jump off. This was very efficacious both to Max and to me—for I did not have to leave my chair to effectively control Max's good behavior. (Of course, re-conditioning training was necessary from time to time.)

In common sense terms it would be said that Max had learned (knew) the meaning of the word. If cats were able to talk as we do, Max would undoubtedly have said that the word NO had an unpleasant meaning, that she did not like the word, and so on. This type of "awareness" is not available to cats, however, but she did give adequate indication by her overt behavior of the effect of the conditioning.

Most journals will not publish this type of evidence, however, and it was desirable to extend the results in the practical training situation to an assessment of the hypothesis in a more formal manner. The study to be summarized is very analogous to the exploratory experiment with Max, with the addition of recording one of the physiological responses elicited by the UCS, and verbal indications of subjects feelings about or meaning for the CS word since human subjects were used.

The response selected to measure some of the internal "emotional" responses that should have been conditioned in the procedure was a response of the sweat glands in the palm of the hands, the GSR. However, that is only part of the test of the classical conditioning theory of word meaning. An equally important aspect of the preliminary study with Max was that the word came to control appropriate, meaningful behavior of the animal. In the present study, in addition to the measurement of conditioned "emotional" responses, the possibility was tested that the process of classical conditioning would produce effects in the subject that were more obviously what we refer to as word meaning.

That is, it has been found that word meaning may be reliably judged by individuals using seven-point rating scales. Using factor analytic methods Osgood and associates (Osgood et al., 1957; Triandis and Osgood, 1958) have shown that what is called evaluative meaning is a widespread type of word meaning both in terms of the number of words with such meaning as well as in the fact that this type of word meaning occurs similarly in different language cultures. Moreover, inspection of words that are strong in evaluative meaning lends support to the conditioning analysis. Thus, words that have positive evaluative meaning (for example, GOOD, BEAUTIFUL, SWEET, TASTY, FRAGRANT, DINNER, HAPPY, DOLLAR, SWIM) customarily occur when "positive" types of environmental events are present.

On the other hand, words that have negative evaluative meaning (like UGLY, SOUR, DIRTY, AWFUL, FOUL, SICK, PAIN, CRY, HURT, and so on) are more customarily paired with aversive stimulus events.

To summarize the rationale, pairing aversive stimuli with a word should condition a response to the word. In addition, as a result of this conditioning, the meaning of the word should move toward the negative evaluative pole of an appropriate rating scale.

In the study under discussion (Staats et al., 1962) a word was presented with aversive stimuli (either electric shock or loud noise). It would be expected that the word would come to elicit a response the aversive stimuli elicited and that the subjects would thus rate the word as "unpleasant" in meaning. A list of words was presented orally to both an experimental and a control group of subjects with instructions to learn the list of words. The subjects in the experimental group were given a shock or presented with a loud, harsh sound after 9 of 14 presentations of the word LARGE as it occurred in the list. These aversive stimuli, as the UCS, elicited a palmar sweat gland reaction (GSR). The control group also received the shock and sound, but never in contiguity with the word LARGE. During this process for both groups a record was kept of the GSR. At the end of the procedure the word LARGE was presented without shock or sound for both groups, and the GSR to the word alone was recorded. In addition, both groups of subjects were asked to rate the "pleasantness" of the meaning of some of the words presented in the word list, including the word LARGE.

The results of the GSR recordings and the word-meaning ratings for the experimental and control groups indicated that (1) pairing the word LARGE with shock and noise had changed the rated meaning of the word and made it more unpleasant; (2) the GSR response had been conditioned to LARGE; and (3) the intensity of the rated meaning of the word was significantly related to the intensity of the conditioned GSR.

Thus, when subjects had the experience in which a word was systematically paired with aversive environmental stimuli, the word gained a negative evaluative meaning as measured by the two indices used in the present study: the word acquired negative affective meaning and the word came to elicit one of the easily measurable emotional responses elicited by the aversive stimuli, the galvanic skin response. Actually, it might be expected that other responses elicited by the aversive stimuli were also conditioned to the word--for example, a change in heart rate, changes in circulatory responses, glandular responses, and responses in the central nervous system. It may be suggested that the two indices of the conditioned meaning were related in the following way. In the rating procedure, presentation of the word LARGE to members of the experimental group would elicit the conditioned emotional responses. These responses elicited by LARGE would then result in (mediate) the negative rating of the word. The fact that the intensity of the rating of the meaning of the word, as well as the magnitude of the galvanic skin response, were significantly related gives further support to the analysis of affective meaning in terms of classical conditioning. The more strongly the individual subject was conditioned to respond emotionally to the word in a negative way, the more strongly he felt about the word, and thus the more negatively he rated the meaning of the word.

These findings have since been replicated by Maltzman and associates (1965). Their findings corroborate the original results and analysis, both in the conditioning of a GSR to a word as well as in the conditioning of word meaning. Maltzman et al. again found that the extent of word meaning conditioning was related to the extent of GSR conditioning. This last finding was obtained by varying the intensity of the UCS for different groups of subjects. When this was done it was found that for groups of Ss conditioned with a more intense UCS the CS word elicited a stronger GSR. Moreover, the more intense UCS resulted in the conditioning of a stronger negative evaluative meaning. Thus, the basic theory of affective word meaning in terms of classical conditioning principles appears to be well supported by experimental results.

HIGHER-ORDER CONDITIONING OF AFFECTIVE MEANING

The principle of conditioning that has been discussed may be called simple, or primary, classical conditioning. However, there is an additional principle of conditioning that expands the import of the basic principle considerably. It seems that when a particular stimulus, previously neutral with respect to a particular response, has come as a CS to elicit that response, that stimulus can now "transfer" the response to yet other neutral stimuli. That is, a CS following strong conditioning, can serve as a UCS in an additional conditioning process.

Although higher-order classical conditioning is difficult to produce in the laboratory, natu-

ralistic observations of human behavior suggest that it occurs prominently in real life. As an example, let us say that a child has acquired the meaning of the word BAD, but has had no experience with the word EVIL. The word EVIL at this point is in essence a meaningless nonsense syllable. Let us say, however, that he reads EVIL in a book and asks the teacher what the word means, and the teacher responds EVIL MEANS BAD. We may observe that, after he goes back to his desk muttering EVIL MEANS BAD to himself several times, the child uses and responds to the word appropriately—as though it were now meaningful.

This type of occurrence is extremely common in everyday life and it fits what we would expect upon the basis of laboratory demonstrations of higher-order classical conditioning. That is, the word BAD has come to be a CS through being paired with aversive UCS of various kinds. When this conditioning has become very strong, the word BAD can now serve as a UCS itself. When paired with new words, the meaning responses elicited by the word BAD will be conditioned to the new words. The new word, EVIL in this case, will be conditioned to elicit the same responses as does BAD, and in this way will come to be meaningful.

The author first tested this analysis by pairing a nonsense syllable with a particular word in informal studies. In the procedure the subjects were asked to rate the meaning of the nonsense syllable after it had been paired with words of a certain meaning. The results showed the expected conditioning; that is, the meaning of the nonsense syllable became like that of the word with which it was paired.

Following this encouragement the author developed a more formal method for testing the experimental hypothesis that a nonsense syllable (or other word) paired with words that elicit a particular meaning in people in our language community will come to elicit the same meaning. In this procedure subjects were presented with a nonsense syllable projected upon a screen. The experimenter pronounced a word aloud and the subject repeated the word while looking at the nonsense syllable. The subject was led to believe that the study concerned how two types of learning—looking at nonsense syllables and hearing words—took place at the same time. Although a different word was presented each time the nonsense syllable was shown on the screen, the nonsense syllable was paired only with words that elicited the same type of affective meaning. Thus, one nonsense syllable was systematically paired one time each with words eliciting positive evaluative meaning, such as BEAUTY, WIN, GIFT, SWEET, HONEST, RICH, FRIEND, VALUABLE, STEAK, HAPPY, HEALTHY, SUCCESS, MONEY, and so on. It would be expected that the nonsense syllable would be conditioned to elicit this type of meaning. Another nonsense syllable was paired one time each with words eliciting negative evaluative meaning, such as BITTER, UGLY, SAD, SOUR, DIRTY, EVIL, FAILURE, DISGUSTING, AGONY, FEAR, and so on. It would be expected that this nonsense syllable would be conditioned to elicit negative evaluative meaning. In addition, several other nonsense syllables were presented in the same manner paired with words that elicited no systematic type of meaning.

Two groups of subjects were used. With one group of subjects the nonsense syllable YOF was paired with positive evaluative meaning words and the syllable XEH was paired with negative evaluative meaning words. With another group of subjects YOF was paired with the negative words and XEH with the positive words. Following the conditioning procedures the subjects rated the way that they "felt" about the nonsense syllables, since that "might have affected the way they learned them." The results showed the predicted conditioning; the subjects were conditioned to feel the same way about the syllables as they did about the affective meaning words with which the syllables were paired. The author's findings were then replicated using UCS words that had two additional types of meanings (Staats & Staats, 1957), with positive results.

Additional studies conducted by the author and associates showed that word meaning could be conditioned in the same manner to other words (Staats & Staats, 1958a), that the greater the number of conditioning trials the stronger the conditioned meaning (Staats & Staats, 1959), and that evaluative meaning could be conditioned to national names (Staats & Staats, 1958b). The last study is important in suggesting that what we call attitudes towards people and groups of people can be considered to be responses that have been established through classical conditioning. Moreover, the various studies suggest that this conditioning occurs on the basis of language conditioning. The individual is conditioned to respond in certain emotional ways to words. Once this has happened he may undergo further conditioning to various other

social stimuli simply through the presentation of these words. The implications of this analysis are widespread. It is suggested that attitudes, affective meaning, emotional responses, and so on are different names for the same very important behaviors in man and that these behaviors are acquired according to the principles of classical conditioning, many times with language implementing the process.

THE FUNCTION OF AFFECTIVE MEANING WORDS

So far, we have talked about the acquisition of these emotional meaning responses. Much of the importance of this aspect of language, however, derives from the manner in which words which have this type of meaning function in affecting further behaviors of the individual. In order to discuss this important function of words having emotional meaning, it is necessary to introduce another principle of behavior—the principle of reinforcement, or the principle of operant conditioning. This principle may be summarized simply: there are stimuli that, when presented following an instrumental (motor) response, will increase the frequency of occurrence of that response, or maintain the frequency if the response is already in good strength. There are also stimuli that have the opposite effect upon the strength of a response which they follow; that is, they will weaken the response or make it occur less frequently. These stimuli, which are important in shaping various types of behavior, are called rewards in the former case and punishments in the latter.

Again, some stimuli have this function on an unlearned basis. To the deprived organism food will serve as a reward (called a reinforcer) in the sense described above. To the deprived organism water will also. Other unlearned rewards to the suitably deprived organism are sex stimulation, warmth, air, and so on. On the other hand, strongly bitter substances, strong mechanical, thermal, chemical, or electrical tactile stimulation, as well as strong light and sounds, are all punishments, or aversive stimuli (negative reinforcers).

It is enlightening to point out here that the stimuli named above are also stimuli that have a function in a classical conditioning sense. That is, food will strengthen motor responses that it follows, and as such it is a positive reinforcer. In addition, as we know, food will also elicit salivation and can thus serve as a UCS in a classical conditioning sense. The important point is that one stimulus may function both as an unconditioned stimulus and also as an unlearned reinforcing stimulus. This point is crucial to the analysis to be developed.

One other point must be made before moving on. As with classical conditioning, some stimuli do not have a rewarding or reinforcing function to begin with but are neutral in this respect. Such stimuli can acquire this characteristic, however, on the basis of classical conditioning. That is, when a stimulus such as food is paired with a stimulus that does not have a rewarding function, the new stimulus will come to be a reinforcer also. The stimulus may then be called a conditioned or learned reinforcer.

It was not always realized that the principle by which new stimuli came to be conditioned reinforcers was that of classical conditioning (see Keller & Schoenfeld, 1950). Moreover, the significance of this overlap has not been elaborated so that its important implications can be seen. To continue, however, neutral stimuli that are paired with positive reinforcers (rewards) will become conditioned positive reinforcers. Neutral stimuli that are paired with negative reinforcers will become conditioned negative reinforcers. Thus, the second function of some stimuli, their reinforcement value, may also be transferred to new stimuli. Moreover, the principle by which this is done is that of classical conditioning.

It may be concluded that the process of classical conditioning can change the neutral stimulus in two ways. The UCS elicits a response and the neutral stimulus comes as a CS to elicit a response. If the UCS is also a reinforcer the neutral stimulus will also come to be a reinforcer. It is easy to conclude that the stimulus acquires reinforcement value because it has come to elicit the same response as does the UCS. Certainly the acquisition and decrease in conditioned reinforcement value appears to follow the same principles that pertain for the acquisition and decrease in the strength of the conditioned response. The central point to remember, however, is that as a stimulus becomes a CS it also becomes a conditioned reinforcer, when the UCS is a reinforcer.

With this analysis in mind, it is now possible to return to the discussion of the significance of affective word meaning. It has already been suggested that words in the everyday life situation come as conditioned stimuli to elicit affective or emotional meaning responses. According to the analysis just given, it would also be expected that these words would through the same classical conditioning process also become conditioned reinforcers, either learned rewards or punishments. For

example, it was stated that words paired with stimuli such as food should come to elicit a positive emotional meaning response. However, food is also a reinforcer. Thus, words that are paired with food should come to be conditioned reinforcers in the process of being conditioned to elicit the positive emotional meaning response.

The experiment in which the word LARGE was paired with the aversive stimuli of electric shock and loud noise can be used to illustrate this analysis. In the experiment, the galvanic skin response was conditioned to the word, and the subjects so conditioned also indicated that the word had acquired a negative meaning. Since electric shock and loud noise are negative reinforcers, in addition to being UCS, it would be expected that the word LARGE would also have become a negative conditioned reinforcer for the subjects who had been involved in the conditioning procedure. That is, presentation of the word LARGE after a subject had made a motor response should have had the effect of decreasing the frequency of emission of that motor response.

Moreover, it may be suggested that the rating scale that was used to measure the extent of the classical conditioning of the meaning response should also serve to measure the reinforcement value that the word LARGE had acquired for these subjects. It is thus generally suggested that rating procedures that measure the affective meaning of a word, as it is acquired according to the principles of classical conditioning, also measure the extent to which the word will function as a reinforcing stimulus in an operant conditioning sense. In general it is hypothesized that semantic rating scales of evaluative meaning (such as used by Osgood and Suci, 1955) actually index the reinforcing properties of words, as well as the conditioned stimulus value of the words. Words with positive affective meaning ratings should have positive reinforcing value, and words with negative affective meaning ratings should have negative reinforcing value.

This explicit integration of the principles of classical conditioning, operant conditioning, and the concept of word meaning immediately suggests a number of experimental and theoretical implications in the context of the study of language. As a primary implication, it should be possible to derive experimental hypotheses to clearly test the possibility that affective meaning words will function as reinforcing stimuli, capable of producing new learning in an instrumental conditioning sense. Thus, if positive affective meaning words, as measured on a rating scale, were presented whenever a particular motor response occurred, the response should occur more frequently. The converse should be true for negative affective meaning words. A study (Finley & Staats, in press) to test this analysis has been conducted.

> ...A group of positive evaluative meaning words, a group of negative evaluative meaning words, and a group of words without evaluative meaning were selected on the basis of semantic differential ratings of 6th grade children. Then other 6th grade children were used as subjects in a situation where the task was to press either a right-hand button or a left-hand button when a light in front of the subject was illuminated. After a pre-conditioning period to tabulate the frequency of the two responses, the positive, negative, or non-evaluative meaning words were presented contingent upon each left-hand response. For one group of subjects each left-hand response occasioned the auditory presentation of a positive meaning word, for another group a negative meaning word, and for a third group a non-evaluative meaning word. [A large class of each type of word was used so that a word was used only once. Examples of positive meaning words are HOLIDAY, LAUGHTER, BLOSSOM, DOLLAR, AMERICA, VACATION, FUN, HOME, FOOD, TREAT, and so on. Examples of negative meaning words are UGLY, PAIN, BITTER, FAT, SICK, HUNGER, HARM, ASHAMED, HATE, FELL, WORRY, and so on.] Over 6 blocks of 10 trials (the first block was pre-conditioning) of making one or the other response, the subjects increased in their rate of emission of the left-hand response when the response was followed by positive evaluative meaning words. When the negative evaluative meaning words were presented contingent upon the response, the response decreased in frequency. The words without evaluative meaning, although they were meaningful in other ways, did not systematically increase or decrease the strength of the response.
>
> The results showed that words with positive evaluative [emotional] meaning function as positive reinforcers, words with negative evaluative [emotional] meaning function as negative reinforcers, and words without evaluative meaning, although otherwise meaningful, do not function as reinforcers. . . . In the light of the previous treatment of word meaning as classically conditioned these results support the contention that

> conditioned reinforcement value is [classically] conditioned and that it depends upon the conditioned response. Furthermore, the experiment helps integrate the study of word meaning and the semantic rating of words with the principles and findings of operant conditioning. It also suggests that semantic differential rating scales can be used to measure the reinforcement value of stimuli, that is, the extent to which stimuli will shape and maintain human behavior. This suggestion has a good deal of significance since the study of psychological measurement, as one example, concerns to a large extent the assessment of the reinforcing value of stimuli, as in tests of interests, values, attitudes, and personality (Staats, 1964b, pp. 210-211).

It could also be said that we learn a verbal concept of reinforcement. In common sense terms it could be said that many words have, or express, a positive or negative reinforcement concept. That is, there are many words that have the ability to shape new motor learning when applied in a response-contingent manner, because of the meaning that these words acquire for people in our language culture. This may be seen as one of the most important functions of language, and an integration of learning principles offers a more powerful conception of this central type of human behavior

CONCLUSIONS

Words appear to acquire meaning, that is, come to elicit responses, through the process of classical conditioning. An important type of meaning involves the acquisition of emotional responses under the control of words. Such words, once learned, can "transfer" the responses they have come to elicit to other words and other objects with which they are paired.

In addition, however, these words can serve as reinforcers and effect the acquisition of other types of learning according to the principles of operant conditioning. This is one of the important, perhaps the most important, aspects of language. It is suggested that there are many, many verbal stimuli produced by others or by ourselves that have reinforcing value and shape our own and other's behaviors. This compendium of reinforcing words does not consist only of words such as GOOD, CORRECT, WELL DONE, and other evaluators of performance, statements of praise and flattery--or on the other hand criticism, insults and threats. The words included in the foregoing experiment, for example, were not those ordinarily used in these ways as rewards or punishments. It may be concluded that any word that has positive affective meaning will function as a reinforcing stimulus, for example.

The great generality of this suggestion is supported by the studies of Osgood and his associates which show that affective meaning words occur in various languages in the same manner as in our language (Osgood et al., 1952). In addition, the major variance in the factor analytic study of word meaning (Osgood, Suci, & Tannenbaum, 1957) is accounted for by the evaluative (emotional) dimension or, in our terms, the reinforcing dimension.

The study of word meaning conducted by Osgood and associates, however, has focused almost entirely upon the measurement of meaning and the reliability of this measurement over different languages. Only a cursory attempt has been made to relate a learning conception of word meaning to the measurement of meaning (see Osgood et al., 1957). The present analysis, on the other hand, indicates the manner in which affective meaning is acquired and cites evidence in support of this view. Furthermore, the concept of word meaning, as well as its method of measurement, has been fitted much more solidly into the integrated learning theory. Based upon an analysis of word meaning derived from an integration of classical and operant conditioning, it was possible to demonstrate that affective meaning words have the properties of reinforcing stimuli. The results support both the classical conditioning analysis of meaning acquisition, as well as the operant conditioning analysis of the manner in which affective meaning words function.

Further research should be conducted to test the possibility that the intensity of the rating of meaning is related to the strength of the reinforcing value; to test the possibility that schedules of reinforcement will apply to the word reinforcers used in the present study; and especially to attempt to produce word reinforcers in the laboratory, on the basis of simple and higher-order conditioning of meaning. The heuristic value of the analysis appears to be quite large.

It may be added that it is the present author's contention (see Staats, 1964a, 1964b, 1965a, 1965b; Staats & Staats, 1963) that a more powerful learning approach to language is gained by integrating classical and operant conditioning principles and the findings of the various approaches to language in a comprehensive integrated, learning theory. The present discussion forms part of this attempt. In the

analysis the major principles of classical and operant conditioning were integrated, along with the subconcepts of conditioned reinforcement and word meaning and its measurement. The integrated learning analysis appeared to generate new experimental results and further implications for the study of language. The results encourage further steps in the development of an integrated learning theory of complex human behavior.

III

IMAGES IN LANGUAGE (DENOTATIVE MEANING)

It has been suggested that many words are systematically paired with an aspect of the environment—with a particular stimulus. According to the principle of classical conditioning, any response that the stimulus elicits should be conditioned to the word involved. The preceding discussion has suggested that many stimuli elicit emotional or "reinforcing" responses, and thus that many words come to elicit this type of meaning response.

However, there are many stimuli that we are "sensitive" to that do not elicit emotional or reinforcing responses. We <u>see</u> these stimuli, <u>hear</u> them, <u>feel</u> them, and so on, but these stimuli will not function as reinforcing stimuli in an operant conditioning sense—and presumably they have no effect in eliciting emotional responses. Nevertheless, naturalistic observation suggests that the process of classical conditioning—of pairing a word with one of these types of stimuli--does affect the word involved. For example, the word BLUE, which is systematically paired with blue light in our language experience, acquires different qualities than does the word SQUEAK, which is systematically paired with a certain type of auditory stimulation. If we assumed that such sensory stimuli also elicit responses—sensory responses—the manner in which words acquire <u>denotative</u> meaning would also be suggested from our knowledge of classical conditioning.

That is, it can be suggested that seeing a visual stimulus is actually <u>responding</u> to the stimulus, hearing a sound stimulus is responding to the stimulus, touching a tactile stimulus is responding to the stimulus, and so on. Furthermore it can be suggested that <u>part</u> of the sensory response elicited by a sensory stimulus can be conditioned to another stimulus with which it is paired. When this has occurred the new stimulus will come to elicit the conditioned part of the sensory response, which we commonly call an image. Finally, many <u>words</u> are stimuli that in this manner come to elicit conditioned sensory responses (images) in the individual who has been so conditioned.

These suggestions have been couched in terms that suggest speculation. However, in addition to the theory of classical conditioning, the foregoing analysis, and supporting naturalistic observations, there are experimental results that actually lead to these statements as conclusions. Leuba (1940) has shown that a neutral stimulus paired with a sensory stimulus as the $\underline{UCS}$ will become a $\underline{CS}$ that elicits what is described in everyday life as an image. For example, while a subject was hypnotized Leuba paired a buzzer as the $\underline{CS}$ with a pinprick as the $\underline{UCS}$. It was found that the subject would later report a painful sensation on his hand simply on the presentation of the buzzer. Ellson (1941) has also shown that a light as the $\underline{CS}$ when paired with a tone as the $\underline{UCS}$ will come to elicit the faint hearing of the tone before the tone has been presented. He called these hallucinations, produced by sensory conditioning. Ellson cites other evidence in the literature for the conditioning of sensations.

These are examples of the direct conditioning of sensory responses. In addition, however, there are a number of other experimental results that support the same analysis. Some of these experiments have generally been given the term sensory pre-conditioning. Brogden (1939) originally paired a bell and a light for a number of trials, using dogs as subjects. Later he used one of these two stimuli as the $\underline{CS}$ in another phase of the experiment and conditioned a response to it. It was then found that the response when conditioned to the bell sound, for example, would also be elicited by the light—even though the response had never been conditioned to the light. Thus, as a result of being presented together a number of times, light and the bell had become functionally the same. What happened to one of the stimuli would result in (or generalize to) the same type of conditioning to the other stimulus. This type of result has been shown to occur with human subjects (see, for example, Brogden, 1947).

These results would be expected on the

basis of the following analysis. If each sensory stimulus, the light and the bell, elicits a sensory response that can be conditioned, then the pairing of the stimuli would result in two types of conditioning. The sensory response to the light, the seeing of the light, would be conditioned (at least in part) to the bell sound. When this result is considered, the bell is the $\underline{C_S}$ and the light which elicits the seeing response is the $\underline{UC_S}$. The process is shown in Fig. 1. The seeing response, r in the figure, is printed in lower case letters to indicate that it is not directly observed in this experiment. The seeing response is depicted as having stimulus properties also, that is as r--s.

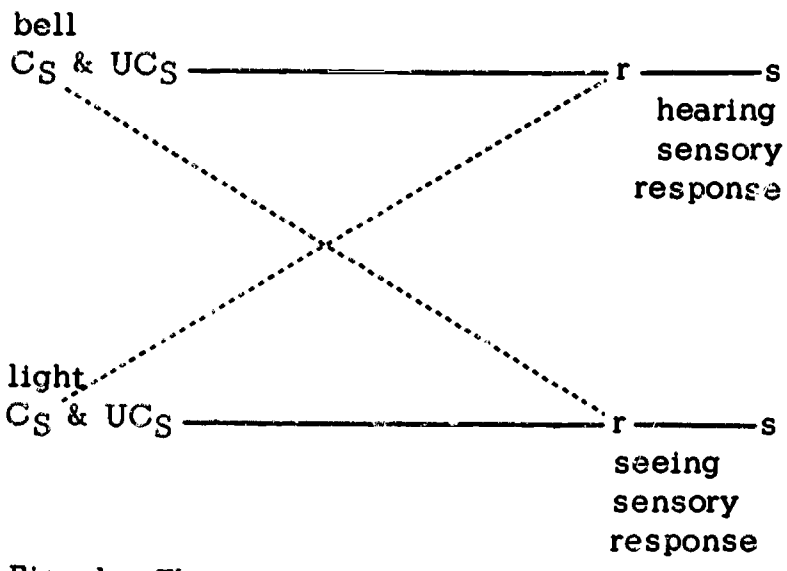

Fig. 1. The pairing of two sensory stimuli results in the sensory response elicited by each (as a $\underline{UC_S}$) being conditioned to the other (as a $\underline{C_S}$).

In addition, the same process should also occur with the sensory response to the bell. That is the bell as a $\underline{UC_S}$ results in the response of hearing the bell, which according to the same rationale should be conditioned to the light. This process is exactly the same, except that the roles of the $\underline{C_S}$ and the $\underline{UC_S}$ are filled by the light and the bell respectively rather than the reverse.

Thus, as a result of the pairing of the two stimuli, each comes to elicit the sensory response elicited by the other. Because of this it would be expected that the two stimuli, the bell and the light, would now have become functionally the same—even though before this process they had not been. That is, now if one of the stimuli is involved in an additional conditioning process, the resulting conditioning will affect the other stimulus in the same way for the subject involved. The rationale for this expectation is shown in Fig. 2. Let us say that the subject who had previously

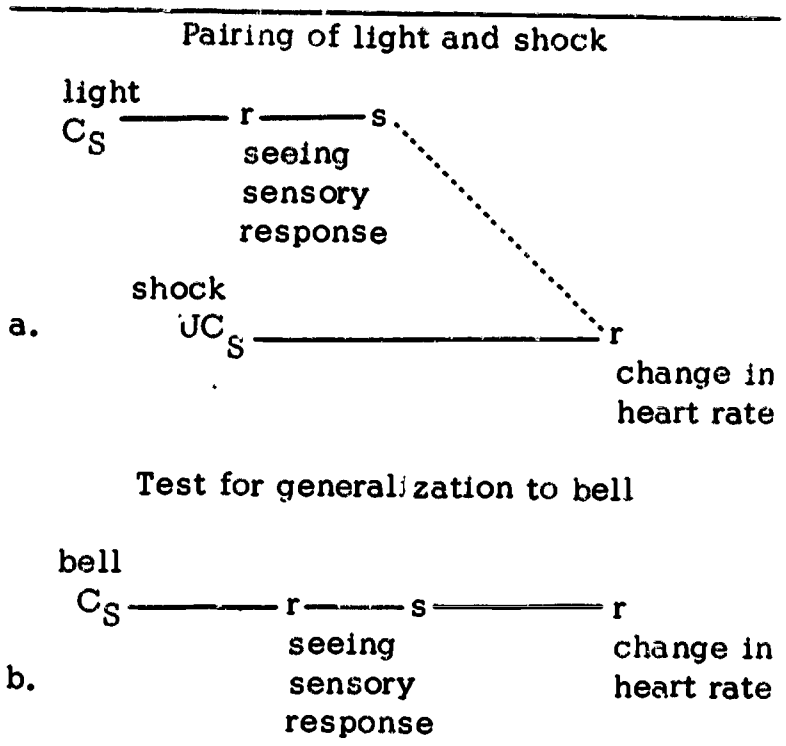

Fig. 2. (a) The pairing of the light with the shock results in the heart rate response being conditioned to the sensory response elicited by the light. (b) In the test for generalization, the bell elicits the seeing sensory response also and it then elicits the heart rate response.

been presented with the bell and the light is put into another conditioning procedure. In this one the light is again presented, paired with an electric shock as the $\underline{UC_S}$. Now electric shock elicits as a response a change in the rate at which the subject's heart is beating. This response, among other occurrences, will be conditioned to the stimulus produced by the seeing response elicited by the light. That is, the light as a stimulus elicits the seeing sensory response r--s and the heart rate response is conditioned to the stimulus part of this sensory response. The stimulus part of the sensory response thus becomes a $\underline{C_S}$ for the heart rate response. (See Fig. 2a)

Now it can be seen why the bell will also elicit the heart rate response without ever having been paired with the shock. The bell, because of previous pairing with the light, also elicits the seeing response on a conditioned basis and this conditioned sensory response elicits the heart rate response, as shown in Fig. 2b.

This is a complicated analysis. However, it does suggest that sensations have response characteristics and can be conditioned to new stimuli. There are additional experimental results that anchor these findings and the resulting analysis more firmly in the area of language

learning. This type of study has been considered under the label of semantic generalization.

In one type of semantic generalization study a response of the subject is conditioned to a word and then the stimulus object the word "denotes" is later presented to the subject. It has been found that the object, never itself conditioned to elicit the response, will do so—after the word has been conditioned to elicit the response. That is, the two stimuli—the word stimulus and the object stimulus—are functionally equivalent; something that happens to the word generalizes to the object. The converse is also true. If the response is conditioned to the stimulus object, the word will as a result also elicit the response. The following may be used as an example. Let us say that the word BLUE has been used as the $\underline{C}_S$ in a classical conditioning procedure, being paired with an electric shock as the stimulus. After some trials the word BLUE will come to elicit a conditioned heart rate response. At a later time if the subject involved is shown blue light it will be found that the blue light will also elicit the conditioned heart rate response.

This equivalence of function reminds us of the equivalence already described which occurred between the two sensory stimuli after they had been paired together. Actually, the same analysis may be used to account for the facts of semantic generalization. That is, the reason this word-to-object generalization will take place may be thought to involve previous conditioning like that in the sensory preconditioning. That is, in our language culture we have all had a past history when the word BLUE as a stimulus had been paired with blue light on multitudinous occasions. For example, we have all had experience when the word BLUE is spoken by ourselves or someone else at the same time that we are looking at a blue object. This "pre-conditioning" experience would be expected to perform the type of conditioning shown in Fig. 3.

As shown in Fig. 3a, when the word BLUE is paired with the blue light, the blue light elicits its sensory response. The sensory response is conditioned to the word BLUE which then comes, as a $\underline{C}_S$, to elicit the conditionable parts of the blue sensory response. At this point, for this subject, both the blue light stimulus and the word BLUE elicit the same, or a similar, response. At a later time in the semantic generalization experiment, the word BLUE is paired with the electric shock as shown in Fig. 3b. Each time the word blue is presented it elicits the blue sensory response previously conditioned to it. The shock elicits the heart rate response, and this response is conditioned to the blue sensory response (or, rather, the stimulus components of this response). Thus, as a result of this conditioning the blue sensory response comes to elicit the heart rate response.

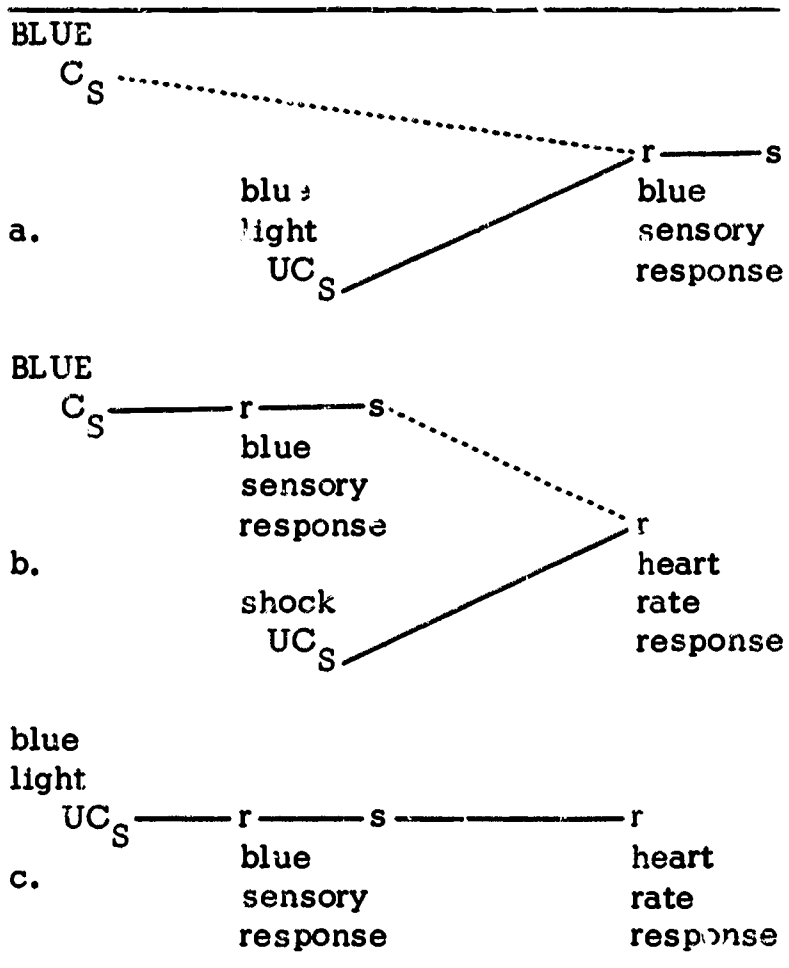

Fig. 3. (a) Pairing of the word BLUE and the blue light conditions the blue sensory response to the word. (b) In further work with the subject shock is paired with the word BLUE, thus conditioning the heart rate responses to the conditioned blue sensory response. (c) The Blue light now also elicits the heart rate response since it elicits the blue sensory response (on an unconditioned basis).

This then establishes the circumstances for the blue light also to elicit the heart rate response, even though this light has never been paired with the shock (Fig. 3c). That is, the presentation of the blue light results in the elicitation of the blue sensory response, and the stimulus of the blue sensory response is a $\underline{C}_S$ for the heart rate response.

Thus, the original pairing of the blue light and the word BLUE made them functionally the same. It would also be expected that conditioning involving a blue light would generalize back to the word BLUE on the basis of the same rationale. In addition, it would be expected that if there was another word that had been paired with blue light many times in the

past, as the word AZURE may have been for someone in our culture, the same functional equivalence would also apply to this word. That is, if a response was conditioned to blue light it would generalize to the word AZURE since it too would elicit the same sensory response as the light. In addition, however, the two words BLUE and AZURE would also be functionally equivalent. Any experience that the individual had with one word would generalize to the other. This would be expected since each would elicit the same conditioned blue sensory response. It is suggested that this is one basis for synonymity. If two words are paired with the same, or similar, stimuli they will come to elicit the same conditioned meaning response. Then anything that happens to one word stimulus, which conditions a new response to the word's conditioned meaning response, will generalize to the other word.

For a summary of the experimental evidence of these various types of semantic generalization see Cofer and Foley (1942). However, Phillips (1958) has performed an experiment that illustrates very nicely the various processes involved and the experiment will be summarized. The materials used were five Turkish words (unfamiliar to the subjects, thus meaningless) and five different shades of gray, varying on a continuum from light to dark. In much the same fashion as a child learns to name objects, the subjects were trained to respond with a particular word to a particular shade of gray. Thus, a particular word was paired with a particular shade of gray. It would be expected that this procedure would condition the sensory response elicited by the particular shade of gray to the particular word. Thus, each word would come to elicit a "gray conditioned sensory response," and each of the responses would, to varying degrees, be similar to the others.

In the second part of the experiment, the CS word previously paired with the darkest shade of gray was now paired with a loud noise in an additional conditioning procedure. This was done until the word would elicit the response elicited by the loud noise which in this case was the GSR. Now, it would be expected that this conditioning procedure would have conditioned the GSR to the gray sensory response elicited by the word. It would be expected, because of this, that each of the other words would now also elicit the GSR to the extent of the similarity of its sensory response (the extent of its synonymity) to the sensory response of the conditioned word—although these other words had not been paired with the electric shock. In general the results corroborated these expectations.

Thus, these various experiments support the analysis that sensory stimuli actually elicit sensory responses in the individual and that these sensory responses can be conditioned in part to other stimuli. The results also suggest that such conditioned sensory responses, or images, can be conditioned to word stimuli, forming the meaning of the word. If this analysis is correct then it should be possible to derive testable hypotheses from the analysis that will be verified in the laboratory in the context of conditioning word meaning.

That is, for example, words that have acquired conditioned sensory meaning should be capable of transferring this meaning to meaningless words with which they are paired. This would be a case of the higher-order conditioning of sensory meaning, following the method described previously for the conditioning of emotional meaning. This was tested in an experiment (Staats et al., 1961) in which a class of words with angular meaning were paired once each with a nonsense syllable, LAJ, which was the CS. The UCS words with angular meaning were SQUARE, BOX, ROOF, TRIANGLE, STEEPLE, DIAMOND, WINDOW, HALLWAY, ZIGZAG, BOOK, PYRAMID, WEDGE. Another nonsense syllable, GIW, was paired with UCS words that had round meaning. These words were COIL, GLOBE, HUB, BARREL, BULB, TARGET, WHEEL, MARBLES, KNOB, HOOP, PEARL, BALL. Two other nonsense syllables were paired with words that had no systematic meaning. Another group of subjects were run under the same conditions except that LAJ was paired with the round meaning words and GIW with the angular meaning words.

After the conditioning procedure all the subjects rated the meaning of the various syllables on four seven-point rating scales, in the manner previously described. The scales used were: angular-round, active-passive, weak-strong, and pleasant-unpleasant. The results showed that the angular or round meaning was conditioned to the nonsense syllable paired with the words having that type of meaning. None of the other types of meaning was conditioned to the nonsense syllables as a result of the conditioning procedures.

Again, the experimental results support the theory that sensory responses may be conditioned in the form of images and that words may in this way acquire their denotative meaning. Based upon this analysis, one of the powers of language is that it removes the need for primary experience with environmental events to learn

adjustive modes of response to those events. The human may simply have experience on a language level, this experience then effecting later responses to the environment. He may then respond as if he has had direct experience with the environment.

The type of generalization that has already been described could account for some of the extensive "symbolic" learning that is possible through language. That is, if a word elicits a sensory response similar to that elicited by the environmental stimulus itself, then any experience the individual has with the word should generalize to the environmental event in the manner already described. For example, if the child is told CLIFFS ARE DANGEROUS, the emotional meaning response he has learned to the word DANGEROUS will be conditioned to the sensory response elicited by the word CLIFFS. Later on, when the child sees a cliff, the full sensory response will be elicited, and the sensory response in turn will elicit the emotional response that has been conditioned to the sensory response. According to the principles of operant conditioning, the child will then avoid the cliff.

It is thus suggested that certain aspects of the acquisition and function of language can be accounted for in terms of the principles of classical and instrumental conditioning. It may also be said in concluding that an analysis in terms of experimentally established antecedent-consequent (causal) principles has certain advantages over analyses not based upon such types of principles. That is, from such analyses hypotheses may be derived that can be checked in the laboratory and, moreover, that can be checked in dealing with practical problems of human behavior. Although not yet complete, an integrated learning analysis of language promises to provide a means of understanding the complex behavior of language and, furthermore, to provide methods and principles for dealing with some of the problems of language acquisition and function.

REFERENCES

Brogden, W. J. Sensory pre-conditioning. J. exp. Psychol., 1939, 25, 323-332.

Brogden, W. J. Sensory pre-conditioning of human subjects. J. exp. Psychol., 1947, 37, 527-540.

Cofer, C. N., & Foley, J. P. Mediated generalizations and the interpretation of verbal behavior: I. Prolegomena. Psychol. Rev., 1942, 49, 513-540.

Ellson, D. Hallucinations produced by sensory conditioning. J. exp. Psychol., 1941, 28, 1-20.

Finley, J. R., & Staats, A. W. Evaluative meaning words as conditioned reinforcers. J. verbal Learn. verbal Behav., in press.

Jenkins, J. J. Mediated associations: Paradigms and situations. In C. N. Cofer and B. S. Musgrave (Eds.), Verbal behavior and learning. New York: McGraw-Hill, 1963. Pp. 210-245.

Keller, F. S., & Schoenfeld, W. N. Principles of Psychology. New York: Appleton, 1950.

Krasner, L. Studies of the conditioning of verbal behavior. Psychol. Bull., 1958, 55, 148-170.

Leuba, C. Images as conditioned sensations. J. exp. Psychol., 1940, 26, 345-351.

Maltzman, I., Raskin, D. D., Gould, J., & Johnson, O. Individual differences in the orienting reflex and semantic conditioning and generalization under different UCS intensities. Paper read at Western Psychological Association, Honolulu, June, 1965.

Mowrer, O. H. The psychologist looks at language. Amer. Psychologist, 1954, 9, 660-694.

Osgood, C. E. Method and theory in experimental psychology. New York: Oxford Univer. Press, 1953.

Osgood, C. E., Archer, W. K., & Miron, M. S. The cross-cultural generality of meaning systems. Progress Report. Urbana: Institute of Communication Research, Univer. of Illinois, 1962.

Osgood, C. E., & Suci, G. J. Factor analysis of meaning. J. exp. Psychol., 1955, 50, 325-338.

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. The measurement of meaning. Urbana: Univer. of Illinois Press, 1957.

Phillips, L. W. Mediated verbal similarity as a determinant of the generalization of a conditioned GSR. J. exp. Psychol., 1958, 55, 56-62.

Russell, W. A., & Storms, L. H. Implicit verbal chaining in paired-associate learning. J. exp. Psychol., 1955, 49, 287-293.

Salzinger, K. Experimental manipulation of verbal behavior: A review. J. exp. Psychol., 1959, 61, 65-94.

Skinner, B. F. Verbal behavior. New York: Appleton, 1957.

Staats, A. W. A behavioristic study of verbal and instrumental response hierarchies and their relationship to human problem solving. Unpublished doctoral dissertation, Univer. of California, Los Angeles, 1955.

Staats, A. W. Learning theory and "opposite-speech." J. abnorm. soc. Psychol., 1957, 55, 268-269.

Staats, A. W. Verbal habit-families, concepts, and the operant conditioning of word classes. Psychol. Rev., 1961, 68, 190-204.

Staats, A. W. Comments on Professors Russell's Paper. In C. N. Cofer and B. S. Musgrave (Eds.), Verbal Behavior and Learning. New York: McGraw-Hill, 1963. Pp. 271-290.

Staats, A. W. Operant learning principles and communication. In A. W. Staats (Ed.), Human Learning. New York: Holt, Rinehart, and Winston, 1964. Pp. 191-196. (a)

Staats, A. W. Conditioned stimuli, conditioned reinforcers, and word meaning. In A. W. Staats (Ed.), Human Learning. New York: Holt, Rinehart, and Winston, 1964. Pp. 205-213. (b)

Staats, A. W. A case in and a strategy for the extension of learning principles to problems of human behavior. In L. Krasner and L. P. Ullman (Eds.), Research in behavior modification. New York: Holt, Rinehart, and Winston, 1965. Pp. 27-55. (a)

Staats, A. W. An integrated-functional learning approach to complex human behavior. In B. Kleinmuntz (Ed.), Problem solving: Research, method and theory. New York: Wiley, 1965. (b)

Staats, A. W., & Staats, C. K. Meaning of verbal stimuli changed by conditioning. Amer. J. Psychol., 1958, 71, 429-431. (a)

Staats, A. W., & Staats, C. K. Attitudes established by classical conditioning. J. abnorm. soc. Psychol., 1958, 57, 37-40. (b)

Staats, A. W., & Staats, C. K. Effect of number of trials on the language conditioning of meaning. J. gen. Psychol., 1959, 61, 211-223.

Staats, A. W., & Staats, C. K. Complex human behavior. New York; Holt, Rinehart and Winston, 1963.

Staats, A. W., Staats, C. K., & Crawford, H. L. First-order conditioning of meaning and the parallel conditioning of a GSR. J. gen. Psychol., 1962, 67, 159-167.

Staats, A. W., Staats, C. K., & Heard, W. G. Denotative meaning established by classical conditioning. J. exp. Psychol., 1961, 61, 300-303.

Staats, C. K. & Staats, A. W. Meaning established by classical conditioning. J. exp. Psychol., 1957, 54, 74-80.

Triandis, H. C., & Osgood, C. E. A comparative factorial analysis of semantic structures in monolingual Greek and American college students. J. abnorm. soc. Psychol., 1958, 57, 187-196.

Underwood, B. J., & Schulz, R. W. Meaningfulness and verbal learning. Chicago: Lippincott, 1960.